WHAT IS CLAIMED IS:

1. A semiconductor device fabrication method comprising the steps of:

polishing the surface of a film-to-be-polished formed over a semiconductor substrate with a polishing pad while a polishing slurry containing abrasive grains, and an additive of a surfactant is being supplied onto the polishing pad to thereby planarize the surface of the film-to-be-polished; and

after the surface of the film-to-be-polished has been planarized, further polishing the surface of the film-to-be-polished with the polishing pad while the polishing slurry and water are being supplied onto the polishing pad.

2. A semiconductor device fabrication method comprising the steps of:

polishing the surface of a film-to-be-polished formed over a semiconductor substrate with a polishing pad while a polishing slurry containing abrasive grains, and an additive of a surfactant is being supplied onto the polishing pad to thereby planarize the surface of the film-to-be-polished; and

after the surface of the film-to-be-polished has been planarized, further polishing the surface of the film-to-be-polished with the polishing pad while a mixture of the polishing slurry and water is being supplied onto the polishing pad.

3. A semiconductor device fabrication method

according to claim 1, wherein

in the step of further polishing the surface of the film-to-be-polished, the water is supplied to a position outer of a position for the polishing slurry to be supplied to.

4. A semiconductor device fabrication method according to claim 1, wherein

in the step of further polishing the surface of the film-to-be-polished, a supply amount of the water is 2 or more times as much as a supply amount of the polishing slurry.

5. A semiconductor device fabrication method comprising the steps of:

polishing the surface of a film-to-be-polished formed over a semiconductor substrate with a polishing pad while an polishing slurry containing abrasive grains, and an additive of a surfactant is being supplied onto the polishing pad to thereby planarize the surface of the film-to-be-polished; and

further polishing the surface of the film-to-be-polished with the polishing pad while at least water is being supplied onto the polishing pad after the surface of the film-to-be-polished has been planarized,

in the step of further polishing the surface of the film-to-be-polished, the finish of the polish being detected based on that a drive current or a drive voltage of a polishing table or a polishing head decreases, increases and begins to again decrease.

6. A semiconductor device fabrication method

according to claim 5, wherein

in the step of further polishing the surface of the film-to-be-polished, the surface of the film-to-be-polished is polished under a polishing pressure which is lower than a polishing pressure in the step of planarizing the film-to-be-polished.

7. A semiconductor device fabrication method according to claim 6, wherein

in the step of further polishing the surface of the film-to-be-polished, the surface of the film-to-be-polished is polished under a polishing pressure of 60 - 300 gf/cm^2.

8. A semiconductor device fabrication method according to claim 5, wherein

the step of planarizing the surface of a film-to-be-polished includes the first polishing step of polishing the surface of the film-to-be-polished under a first polishing pressure, and a second polishing step of polishing the surface of the film-to-be-polished under a second polishing pressure, the second polishing pressure being lower than the first polishing pressure.

9. A semiconductor device fabrication method according to claim 8, wherein

in the first polishing step, the finish of the polish is detected based on that the drive current or the drive voltage of the polishing table or the polishing head beings to decrease.

10. A semiconductor device fabrication method

according to claim 8, wherein

in the second polishing step, the finish of the polish is detected based on that the drive current or the drive voltage of the polishing table or the polishing head stops increasing.

11. A semiconductor device fabrication method according to claim 8, wherein

in the first polishing step or the second polishing step, after the finish of the polish has been detected, the surface of the film-to-be-polished is further polished of a prescribed period of time.

12. A semiconductor device fabrication method according to claim 1, further comprising, before the step of planarizing the surface of the film-to-be-polished, the steps of:

forming over the semiconductor substrate an insulation film having polish characteristics different from those of the film-to-be-polished;

forming an opening in the insulation film;

etching the semiconductor substrate with the insulation film as a mask to form a trench in the semiconductor substrate; and

forming the film-to-be-polished in the trench and over the insulation film,

in the step of further polishing the surface of the film-to-be-polished, the surface of the film-to-be-polished is polished with the insulation film as a stopper.

13. A semiconductor device fabrication method according to claim 2, further comprising, before the step of planarizing the surface of the film-to-be-polished, the steps of:

forming over the semiconductor substrate an insulation film having polish characteristics different from those of the film-to-be-polished;

forming an opening in the insulation film;

etching the semiconductor substrate with the insulation film as a mask to form a trench in the semiconductor substrate; and

forming the film-to-be-polished in the trench and over the insulation film,

in the step of further polishing the surface of the film-to-be-polished, the surface of the film-to-be-polished is polished with the insulation film as a stopper.

14. A semiconductor device fabrication method according to claim 5, further comprising, before the step of planarizing the surface of the film-to-be-polished, the steps of:

forming over the semiconductor substrate an insulation film having polish characteristics different from those of the film-to-be-polished;

forming an opening in the insulation film;

etching the semiconductor substrate with the insulation film as a mask to form a trench in the semiconductor substrate;

and

forming the film-to-be-polished in the trench and over the insulation film,

in the step of further polishing the surface of the film-to-be-polished, the surface of the film-to-be-polished is polished with the insulation film as a stopper.

15. A semiconductor device fabrication method comprising the steps of:

forming in a semiconductor substrate or an insulation film a plurality of trenches including a first inspection trench, and a second inspection trench whose area is larger than the first inspection trench;

forming a film-to-be-polished, filling the trenches;

polishing the surface of the film-to-be-polished with a polishing pad while a polishing slurry is being supplied onto the polishing pad to thereby planarize the surface of the film-to-be-polished;

after the surface of the film-to-be-polished has been planarized, further polishing the surface of the film-to-be-polished with the polishing pad while at least water is being supplied onto the polishing pad; and

detecting whether or not a difference between a film thickness of the film-to-be-polished buried in the first inspection trench and a film thickness of the film-to-be-polished buried in the second inspection trench satisfies a prescribed inspection specification.

16. A semiconductor device fabrication method according to claim 15, wherein

the polishing slurry contains abrasive grains, and an additive of a surfactant.

17. A semiconductor device fabrication method according to claim 15, wherein

an area of the region for the first inspection trench formed in is 1000 - 3600 μm^2, and

an area of the region for the second inspection trench formed in is 7000 μm^2 or more.

18. A semiconductor device fabrication method according to claim 15, wherein

in the step of forming a plurality of trenches, the first inspection trench and the second inspection trench are formed on a scribe line.

19. A semiconductor device fabrication method according to claim 15, wherein

in the step of forming a plurality of trenches, the first inspection trench and the second inspection trench are formed in a chip region.

20. A semiconductor device fabrication method according to claim 5, wherein

in the step of further polishing the surface of the film-to-be-polished, the surface of the film-to-be-polished is polished while even the polishing slurry is being supplied onto the polishing pad.

21. A semiconductor device fabrication method according to claim 15, wherein

in the step of further polishing the surface of the film-to-be-polished, the surface of the film-to-be-polished is polished while even the polishing slurry is being supplied onto the polishing pad.

22. A semiconductor device fabrication method according to claim 5, wherein

in the step of further polishing the surface of the film-to-be-polished, the surface of the film-to-be-polished is polished while a mixture of the polishing slurry and water is being supplied onto the polishing pad.

23. A semiconductor device fabrication method according to claim 15, wherein

in the step of further polishing the surface of the film-to-be-polished, the surface of the film-to-be-polished is polished while a mixture of the polishing slurry and water is being supplied onto the polishing pad.

24. A semiconductor device fabrication method comprising the steps of:

polishing the surface of a film-to-be-polished formed over a semiconductor substrate with a polishing pad while an polishing slurry containing abrasive grains, and an additive formed of a surfactant is being supplied onto the polishing pad to planarize the surface of the film-to-be-polished;

removing the additive adhering to the surface of the

film-to-be-polished while water is being supplied onto the polishing pad, after the surface of the film-to-be-polished has been planarized; and

further polishing the surface of the film-to-be-polished by using the polishing pad while the polishing slurry and water are being supplied onto the polishing pad.

25. A semiconductor device fabrication method comprising the steps of:

polishing the surface of a film-to-be-polished formed over a semiconductor substrate with a polishing pad while an polishing slurry containing abrasive grains, and an additive formed of a surfactant is being supplied onto the polishing pad to planarize the surface of the film-to-be-polished;

removing the additive adhering to the surface of the film-to-be-polished while water is being supplied onto the polishing pad, after the surface of the film-to-be-polished has been planarized; and

further polishing the surface of the film-to-be-polished by using the polishing pad while a mixture of the polishing slurry and water is being supplied onto the polishing pad.

26. A semiconductor device fabrication method according to claim 24, wherein

in the step of removing the additive, the additive adhering to the surface of the film-to-be-polished is removed while the water is being supplied in an amount which is 5 times or more a supply amount of the polishing slurry.

27. A semiconductor device fabrication method according to claim 25, wherein

in the step of removing the additive, the additive adhering to the surface of the film-to-be-polished is removed while the water is being supplied in an amount which is 5 times or more a supply amount of the polishing slurry.

28. A semiconductor device fabrication method according to claim 1, wherein

the abrasive grains comprise cerium oxide or silicon oxide,

the additive comprises poly(ammonium acrylate).

29. A semiconductor device fabrication method according to claim 2, wherein

the abrasive grains comprise cerium oxide or silicon oxide,

the additive comprises poly(ammonium acrylate).

30. A semiconductor device fabrication method according to claim 5, wherein

the abrasive grains comprise cerium oxide or silicon oxide,

the additive comprises poly(ammonium acrylate).

31. A semiconductor device fabrication method according to claim 15, wherein

the abrasive grains comprise cerium oxide or silicon oxide,

the additive comprises poly(ammonium acrylate).

32. A semiconductor device fabrication method according to claim 24, wherein

the abrasive grains comprise cerium oxide or silicon oxide,

the additive comprises poly(ammonium acrylate).

33. A semiconductor device fabrication method according to claim 25, wherein

the abrasive grains comprise cerium oxide or silicon oxide,

the additive comprises poly(ammonium acrylate).